

## REMARKS

### I. INTRODUCTION

In response to the Office Action dated January 23, 2009, claims 1, 3, 37, 38, 39, 41, 72, 75, and 80 have been amended, claims 2 and 40 have been cancelled and claim 123 has been added. Claims 1, 3-9, 11, 13-39, 41-44, 47, 49-73, 75-80 and 123 remain in the application. Entry of these amendments, and re-consideration of the application, as amended, is requested.

### II. CLAIM AMENDMENTS

Applicants' attorney has made amendments to the claims and added a new claim as indicated above. These amendments are fully supported by the specification as filed and introduce no new matter (see, e.g. paragraph [0078] in U.S. Application 2004-0122882).

### III. §101 REJECTIONS

In paragraph (4) of the Office Action, claims 1-9, 11, 13-44, 47, 49-73 and 75-80 are rejected under 35 U.S.C. §101 due to an assertion that the claimed invention is directed to non-statutory subject matter.

Applicants respectfully traverse this rejection because all independent claims recite a practical/physical application and a useful and tangible result. For example, claim 1 recites the use of a processor to perform the steps on those applications in which it is necessary to solve said system of linear equations (see, e.g. page 59, lines 16-18).

Applicants have further amended the claims hereinabove to overcome this rejection, namely by reciting the practical/physical application of **using the above-noted processor to generate filter coefficients**. As discussed for example on page 62, line 13 – page 63, line 28, applications for a method of solving a system of N linear equations in N unknown variables further include those using variables in an adaptive filtering process. As noted for example at page 4, lines 25-30, the use of the claimed methodological approach in such applications offers considerable benefits in terms of efficiency. Finally, claim 123 recites one very specific illustration of this practical/physical application, in particular solving the system of linear equations in an echo cancellation apparatus.

For the reasons noted above, Applicants respectfully request a withdrawal of the rejection under 35 U.S.C. §101.

#### IV. PRIOR ART REJECTIONS

##### A. REJECTIONS UNDER 35 U.S.C. §102

In paragraph (7) of the Office Action, claims 1-9, 11, 13-25, 30-44, 47, 49-61, 66-73 and 75-80 were rejected under 35 U.S.C. §102 as being anticipated by Simon, “An Overlaying Technique for Solving Linear Equations in Real-Time Computing” (Simon).

As is known in the art, solving a set of linear equations is a computationally expensive task. In this context, the specification teaches that filter coefficients can be generated by solving a set of linear equations. In particular, the set of linear equations can be solved by establishing a respective auxiliary value for each of a set of estimate values, and determining if a predetermined condition that involves the respective auxiliary value is satisfied. The estimate is updated if the predetermined condition is satisfied by the computationally inexpensive operation of addition or subtraction of a predetermined scalar value.

In the outstanding Office Action, the Examiner asserts that the feature of updating, in the processor, the estimate if and only if the respective predetermined condition is satisfied, is disclosed by the condition “is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?” of Figure 1 and the subsequent steps taken to update  $x_{\text{next}}$ . As noted below, neither this, nor any other portion of the Simon disclosure teach or suggest the invention recited in the claims as amended hereinabove. For these reasons, the rejections in view of Simon should be withdrawn.

First, the Simon disclosure is concerned with a very different problem than that of invention recited in the claims as amended hereinabove. Specifically, while both Simon and the instant application are concerned with efficiently solving linear equations, Simon is concerned with using an iterative process to solve smoothly varying sets of linear equations starting from an initial estimate and the present invention is concerned with solving a single system of linear equations, such as a set of equations of the form  $A_{\text{new}} \cdot x = b_{\text{new}}$ , to generate filter coefficients Simon does not indicate how it is proposed such a set of equations should be solved.

In contrast to the invention disclosed in Simon, the independent claims as amended hereinabove (e.g. claim 1) are directed to a method for generating filter coefficients in which input signals are processed to form a system of  $N$  linear equations. Illustrating this, in amended claim 1 the method comprises (c) storing an estimate value for each unknown variable in a processor, (d) initialising in the processor each estimate value to a predetermined value and establishing in the processor a respective auxiliary value for each estimate value. For each estimate value, it is determined whether a respective predetermined condition, which involves the respective auxiliary value, is satisfied. The estimate is updated in the processor if and only if the respective predetermined condition is satisfied, the updating comprising adding a predetermined scalar value  $d$  to the estimate value or subtracting a predetermined scalar value  $d$  from the estimate value. The determining is repeated a plurality of times and the estimate values are output from the processor to provide an estimate of a solution to a system of linear equations which provides the filter coefficients.

As discussed in detail below, the Simon disclosure does not teach or suggest the features of the claims as amended hereinabove, i.e. a respective predetermined condition involving a respective auxiliary value for each estimate value, or updating the estimate value if and only if the respective predetermined condition is satisfied, the updating comprising adding a predetermined scalar value  $d$  to the estimate value or subtracting a predetermined scalar value  $d$  from the estimate value. In addition, the Simon disclosure is not directed to a method of generating filter coefficients. For these reasons, the Simon disclosure cannot teach or suggest the invention recited in the claims as amended hereinabove.

In addition, the Simon disclosure cannot anticipate the invention recited in the claims as amended hereinabove because the independent claims (e.g. claim 1) now recite the additional feature wherein the updating of the estimate value comprises adding a predetermined scalar value  $d$  to the estimate value or subtracting a predetermined value  $d$  from the estimate value. In this context, Figure 1 of Simon does not disclose any predetermined scalar value that is either added to or subtracted from the term  $x_{\text{next}}$ . The term  $x_{\text{next}}$  is updated by solving  $A_{\text{new}} \cdot x = b_{\text{new}}$  where the updated  $x_{\text{next}}$ , is the solution vector  $x$  from this equation. Simon does not explain in any way how it is proposed to solve  $A_{\text{new}} \cdot x = b_{\text{new}}$ , however it is clear that Simon does not disclose updating the estimate value by adding a predetermined scalar value  $d$  to the estimate value or subtracting a

predetermined value d from the estimate value. Indeed, solving a set of linear equations such as  $A_{\text{new}} \cdot x = b_{\text{new}}$  is non-trivial, and the present application is directed to a way of solving such a set of linear equations in a computationally inexpensive way.

In making the outstanding rejection, the Examiner asserts that Simon, paragraph under expression (9) and "Finding a Solution for a Set of Linear Equations", discloses the feature of claim 1 of establishing in the processor a respective auxiliary value for each estimate value. The Examiner further indicates in the section "Response to Arguments" of the examination report that the auxiliary value is the value from the internal adjustments for computing the new  $x$  value in the next cycle. It is not understood exactly what in Simon the Examiner believes corresponds to the respective auxiliary value of claim 1. The Examiner further asserts that the predetermined condition is the delta testing to see if the difference of the current and last value is relatively small. The Examiner therefore appears to indicate that the "delta testing", that is the box containing the condition "is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?" discloses determining whether a respective predetermined condition is satisfied, the predetermined condition involving the respective auxiliary value. Applicants respectfully note that one of skill in this art would not agree that the condition "is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?" as disclosed in Simon involves a respective auxiliary value as recited in the pending claims the Examiner appears to suggest.

Instead, a detailed analysis of Figure 1 of Simon shows that the output from the internal adjustments step is a set of linear equations  $A_{\text{new}}$  and a vector  $b_{\text{new}}$  which are passed to a box in which the equation  $A_{\text{new}} \cdot x = b_{\text{new}}$  is solved. The vector  $x_{\text{next}}$  which solves the equation  $A_{\text{new}} \cdot x = b_{\text{new}}$  is output and it is this vector  $x_{\text{next}}$  that is compared to a previous solution in the condition "is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?". If the set of linear equations  $A_{\text{new}}$  and vector  $b_{\text{new}}$  are considered to be the auxiliary value of claim 1 as the Examiner appears to suggest, then it cannot be said that the condition "is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?" is a predetermined condition involving the respective auxiliary value as required by claim 1, since the condition "is  $\|x_{\text{next}} - x_{\text{last}}\|$  small enough?" involve the set of linear equations  $A_{\text{new}}$  and vector  $b_{\text{new}}$ . For this additional reason, the disclosure in Simon cannot anticipate the claimed invention.

For the reasons noted above, Applicants respectfully request a withdrawal of the rejections under 35 U.S.C. §102.

## B. REJECTIONS UNDER 35 U.S.C. §103(a)

In paragraph (9) of the Office Action, claims 27-29 and 63-65 were rejected under 35 U.S.C. §103(a) as being obvious in view of Simon. Applicants respectfully traverse this rejection because, as noted above, Simon fails to teach or suggest the elements recited in the independent claims (e.g. where condition "is  $\| x_{\text{next}} - x_{\text{last}} \|$  small enough?" is a predetermined condition involving the respective auxiliary value as required by claim 1), much less the constellation of elements recited in these claims.

Thus, Applicants submit that independent claims 1, 37, 39, 72, 75, 80 and 123 are allowable over Simon. Further, dependent claims 3-9, 11, 13-36, 38, 41-44, 47, 49-71, 73 and 76-79 are submitted to be allowable over Simon in the same manner, because they are dependent on independent claims 1, 37, 39, 72, 75 and 80, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-9, 11, 13-36, 38, 41-44, 47, 49-71, 73 and 76-79 recite additional novel elements not shown by Simon.

## V. CONCLUSION

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

The Commissioner is hereby authorized to charge Deposit Account no. 50-0494 in the amount of \$470.00. Should any other charges be deemed necessary, please charge any such fees, or credit any overpayments, to Deposit Account No. 50-0494 of Gates & Cooper LLP.

Respectfully submitted,

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